

EXERCISES ON PROBABILITY

SECTION I

MULTIPLE CHOICE (20 MARKS)

- 1** From a normal pack of 52 playing cards, one card is selected at random. Find the probability that it is a spade. I
- A** $\frac{1}{13}$ **B** $\frac{2}{13}$
C $\frac{1}{4}$ **D** $\frac{3}{4}$
- 2** A bag contains four white, three red and two black balls. If a ball is drawn at random, find the probability that it is white. I
- A** $\frac{3}{9}$ **B** $\frac{4}{9}$
C $\frac{2}{9}$ **D** $\frac{5}{9}$
- 3** In a single throw of one die, find the probability of having an even number. I
- A** $\frac{1}{6}$ **B** $\frac{1}{3}$
C $\frac{1}{2}$ **D** $\frac{2}{3}$
- 4** A card is chosen at random from a pack of 52 cards. What is the probability that the card is red or a king? I
- A** $\frac{1}{4}$ **B** $\frac{1}{13}$
C $\frac{9}{13}$ **D** $\frac{7}{13}$
- 5** Two dice are thrown. Find the probability that the sum is less than 5. I
- A** $\frac{1}{4}$ **B** $\frac{1}{12}$
C $\frac{1}{6}$ **D** $\frac{1}{3}$
- 6** A coin is chosen at random from five ten-cent and nine twenty-cent coins. What is the probability that it is a ten-cent coin? I
- A** $\frac{5}{9}$ **B** $\frac{9}{14}$
C $\frac{5}{14}$ **D** 1
- 7** A card is chosen at random from a normal pack of 52 cards. What is the probability that it is a red king? I
- A** $\frac{2}{26}$ **B** $\frac{1}{26}$
C $\frac{4}{52}$ **D** $\frac{1}{52}$
- 8** A three-digit number is to be formed from the digits 4, 5 and 6 that are written on cards. What is the probability that the number will be even? I
- A** $\frac{1}{3}$ **B** $\frac{2}{3}$
C $\frac{3}{3}$ **D** None of these

- 9** A letter is chosen at random from the word 'MATHEMATICS'. What is the probability that it will be a vowel?

A $\frac{1}{11}$ **B** $\frac{2}{11}$
C $\frac{3}{11}$ **D** $\frac{4}{11}$

- 10** A three-digit number is to be formed using the digits 3, 6 and 5. What is the probability that the number will be divisible by 5?

A $\frac{1}{3}$ **B** $\frac{1}{2}$
C $\frac{2}{3}$ **D** 1

- 11** The numbers from 1 to 10 are written on cards. If one card is chosen at random, what is the probability that the number on the card will be a multiple of 3?

A $\frac{1}{3}$ **B** $\frac{2}{3}$
C $\frac{3}{10}$ **D** $\frac{4}{10}$

- 12** A die is thrown. Find the probability of throwing an odd number.

A $\frac{1}{6}$ **B** $\frac{1}{3}$
C $\frac{1}{2}$ **D** $\frac{2}{3}$

- 13** From a normal pack of 52 playing cards, one card is selected at random. Find the probability that it is a queen of hearts.

A $\frac{1}{52}$ **B** $\frac{1}{26}$
C $\frac{1}{13}$ **D** $\frac{1}{4}$

- 14** A letter is chosen at random from the word 'FANTASTIC'. Find the probability that it will be a T.

A $\frac{1}{9}$ **B** $\frac{2}{9}$
C $\frac{1}{3}$ **D** $\frac{2}{3}$

- 15** A bag contains 2 red balls, 3 blue balls and 5 yellow balls. A ball is chosen at random. What is the probability that it will be yellow?

A $\frac{2}{10}$ **B** $\frac{3}{10}$
C $\frac{1}{2}$ **D** $\frac{5}{9}$

- 16** In a class of 25 students, 10 play tennis. If a student is selected at random, what is the probability the selected student plays tennis?

A $\frac{1}{5}$ **B** $\frac{2}{5}$
C $\frac{3}{5}$ **D** $\frac{4}{5}$

- 17** A number is chosen at random from the numbers 1 to 20 inclusive. What is the probability of choosing a prime number?

I

- A** $\frac{7}{20}$ **B** $\frac{2}{5}$
C $\frac{9}{20}$ **D** $\frac{11}{20}$

- 18** A three-digit number is formed from the digits 2, 3 and 4. Find the probability that the number starts with 3?

I

- A** $\frac{2}{3}$ **B** $\frac{1}{2}$
C $\frac{1}{3}$ **D** $\frac{1}{4}$

- 19** A pair of dice is thrown, find the probability of getting a double six.

I

- A** $\frac{1}{6}$ **B** $\frac{1}{36}$
C $\frac{1}{4}$ **D** $\frac{1}{9}$

- 20** There are 1000 tickets sold in a raffle which has 50 prizes. What is the probability that a person will win any prize if he buys one ticket?

I

- A** $\frac{1}{50}$ **B** $\frac{1}{20}$
C $\frac{1}{30}$ **D** $\frac{1}{40}$

END OF MULTIPLE CHOICE SECTION
GO ON TO SECTION II

SECTION II (72 MARKS)

• Show all necessary working.

• Each question is worth 12 marks.

21

(12 MARKS)

- A** A die is thrown. Find the probability of throwing
- i) a two
 - ii) a number greater than 3
 - iii) a seven
 - iv) a zero
 - v) a prime number.
- B** If a coin is tossed, what is the probability of getting either a head or a tail?
- C** A card is drawn at random from a normal pack of 52 cards. Find the probability that the card is:
- i) a club
 - ii) a king
 - iii) a black card
 - iv) an ace or a queen
 - v) not a spade.

1
1
1
1
1
2

22 A A card is selected at random (12 MARKS)

from a set of 9 cards numbered from 1 to 9. What is the probability that the card selected is:

- i) an odd number?
- ii) a number divisible by 4?
- iii) a square number?
- iv) a prime number?

1
1
2
2

- B** A bag contains 5 red, 7 white and 8 green marbles. If one marble is selected at random from the bag, what is the probability of drawing:

- i) a white marble?
- ii) a red marble?
- iii) not a green marble?
- iv) a blue marble?

1
1
2
2

23 A A raffle ticket is drawn from a (12 MARKS)

box containing 100 raffle tickets numbered from 1 to 100. Find the probability that the number of the ticket is:

- i) divisible by 5
- ii) less than 10
- iii) greater than 72
- iv) a number containing the digit 9
- v) a prime number
- vi) a number with the last digit as zero.

1
1
1
1
1
1

- B** Twenty-six cards have been printed with the letters of the alphabet. A card is selected at random. What is the probability that it is:

- i) a consonant?
- ii) a vowel?
- iii) one of the first three letters?
- iv) the letter x or y?

2
2
1
1

24 A A number is formed by using all (12 MARKS)

the four digits 1, 2, 3, 4. What is the probability that the number:

- i) starts with 2?
- ii) is odd?
- iii) is even?
- iv) is less than 4000?
- v) is divisible by 5?

1
1
1
1
1

- B** Two fair dice are thrown. Find the probability that:

- i) the sum of the two numbers shown is 9
- ii) the two numbers are odd
- iii) the two numbers are equal
- iv) the sum of the two numbers is either 11 or 12

2
2
1
2

- 25** Fifty families were surveyed to find (12 MARKS)
how many children each family has
and the following set of data was
tabulated:

Number of children	0	1	2	3	4	5
Number of families	5	10	13	13	4	5

- A** What is the relative frequency (as a fraction) of families having 3 children? **3**
- B** Taking into consideration this survey, what would be the probability that a family selected at random, has 3 children? **2**
- C** Is the probability of this survey the same as the relative frequency? **2**
- D** What is the probability if a family, selected at random, has two or less than two children? **3**
- E** What is the probability of a family having five children? **2**

- 26** A survey involves the test results (12 MARKS)
obtained by a class of 30 students and
is given in the form of a table below:

Marks obtained	30	40	50	60	70	80	90	100
Number of students	1	1	3	8	7	4	5	1

- A** What is the relative frequency (as a fraction) of students who obtained 80 marks? **3**
- B** Based on this survey, what would be the probability that a student selected at random has obtained 80 marks? **2**
- C** Is the probability of this survey the same as the relative frequency? **2**
- D** What is the probability if a student, selected at random, has 80 or more than 80 marks? **3**
- E** What is the probability of a student scoring 100 marks? **2**

END OF SECTION II

EXERCISES ON MEASUREMENT

SECTION I

MULTIPLE CHOICE (20 MARKS)

- 1** Write 367 000 in scientific notation:
A 36.7×10^4 **B** 0.367×10^5
C 3.67×10^5 **D** 3.67×10^{-5}
- 2** Convert 8.5 metres to millimetres.
A 850mm **B** 8500mm
C 85mm **D** 0.085mm
- 3** The circumference of a bicycle wheel is 2.24m. How far does the cyclist travel in 2000 turns of the wheel?
A 854.7m **B** 2340m
C 4480m **D** None of these
- 4** The radius of the Earth is approximately 6400km. What is the circumference of the Earth at the equator?
A 40212km **B** 1.29×10^8 km
C 20106km **D** 38340km
- 5** Pythagoras theorem can be applied to:
A an acute angled triangle
B obtuse angled triangle
C right angled triangle
D any triangle
- 6** The longest side of a right angled triangle is called the:
A shortest side **B** middle side
C hypotenuse **D** none of these
- 7** If two shorter sides of a right angled triangle are 7m and 8m, then the hypotenuse is:
A $\sqrt{65}$ m **B** $\sqrt{85}$ m
C $\sqrt{113}$ m **D** $\sqrt{193}$ m
- 8** If the corresponding angles of two triangles are equal then the triangles are definitely:
A congruent **B** similar
C equilateral **D** isosceles
- 9** All similar triangles are:
A different **B** congruent
C equilateral **D** equiangular
- 10** Two triangles are similar if they have the:
A same shape **B** different shape
C same area **D** different area
- 11** Evaluate $12\sin 85^\circ$, correct to two decimal places.
A 12.05 **B** 11.95
C 1.05 **D** 137.16
- 12** A 3 metres ladder leans against a building with its top reaching a height of 2.6 metres. What angle does the ladder make with the wall correct to the nearest degree?
A 35° **B** 40°
C 30° **D** None of these
- 13** In the triangle ABC, the angle B is 90° , $AB = 4$ m and $AC = 5$ m. Find the size of the angle A correct to the nearest degree.
A 37° **B** 53°
C 39° **D** 27°

14 The diagonal of a rectangle makes an angle of 42° with one of the shorter sides. If the length of the rectangle is 12cm, find the length of the diagonal correct to one decimal place.

- A** 15.8m **B** 22.5m
C 10.5m **D** 17.9m

15 A flagpole and a building are on level ground, 95 metres apart. From the top of the flagpole the angle of depression to the top of the building is 46° . If the flagpole is 120 metres high, how high is the building? Give your answer correct to the nearest metre.

- A** 20m **B** 35m
C 26m **D** 22m

16 Find the area of a square with side length 15cm.

- A** 450cm^2 **B** 225cm^2
C 60cm^2 **D** None of these

I

17 How many square centimetres are in a square metre?

- A** 100 **B** 1000
C 10 000 **D** 100 000

I

18 Approximately how many spherical balls of diameter 0.5cm could be made from a melted down cube of side length 5cm?

- A** 19 **B** 190
C 1900 **D** 19 000

I

19 The volume of a cone with diameter 7cm and height 8cm is closest to:

- A** 56cm^3 **B** 103cm^3
C 392cm^3 **D** 448cm^3

I

20 A cube has a volume of 3375cm^3 . Find the length of each side of the cube.

- A** 5cm **B** 15cm
C 25cm **D** 35cm

I

END OF MULTIPLE CHOICE SECTION
GO ON TO SECTION II

SECTION II (72 MARKS)

- Show all necessary working.
- Each question is worth 12 marks.

21

(12 MARKS)

- A** A swimming pool is in the shape of a rectangular prism, 10 metres long, 4 metres wide and 2.1 metres deep. Calculate the volume of water which the pool holds when full:

- (i) in cubic metres
(ii) in litres ($1000\text{L} = 1\text{m}^3$)

$$\text{Volume of prism} = \text{length} \times \text{width} \times \text{depth}.$$

- B** Calculate 23×16^7 and express your answer in scientific notation rounded off correct to 3 significant figures.

- C** The United Kingdom has an area of 312906 square kilometres while Australia has an area of 7.68×10^6 square kilometres. How many times larger than the United Kingdom is Australia? Give your answer correct to one decimal place.

- D** A traffic roundabout consists of a central circular garden of diameter 12 metres, and two laneways for traffic, each $3\frac{1}{2}$ metres wide, completely encircling the garden.

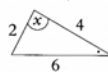
- (i) Calculate the area of the garden ($A = \pi r^2$)
(ii) The local council wishes to resurface the roundabout laneways. Calculate the area of roadway to be resurfaced.

22

(12 MARKS)

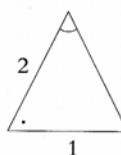
- A** In each pair of triangles given below, use a test of similarity to find the value of the pronumeral.

(i)



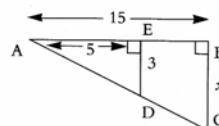
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(ii)



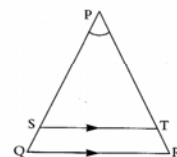
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- B** Name a pair of similar triangles and find the value of x .



2

- C** In $\triangle PQR$, ST is drawn parallel to QR . Prove that $\triangle PST \sim \triangle PQR$.



2

- D** Write True or False for the following statements.

- (i) All equilateral triangles are similar.
(ii) All isosceles triangles are similar.
(iii) All right angled triangles are similar.
(iv) All congruent triangles are similar.
(v) All similar triangles are congruent.

1

1

1

1

1

23

(12 MARKS)

- A** The radius of the Earth is approximately 6400 km.

Calculate:

- (i) the surface area in square kilometres ($A = 4\pi r^2$) correct to 3 significant figures 2
- (ii) the volume correct to 4 significant figures ($V = \frac{4}{3}\pi r^3$) 2

- B** A conical tent has base diameter of 10.6 metres and a slant height of 7 metres. Find the area of the canvas used for this tent correct to 2 decimal places. 3

- C** The diameter of the base of an oil can in the shape of a cone is 18 cm and its height is 12 cm. Find:

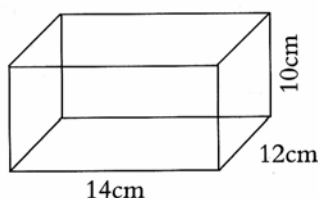
- (i) its volume in cubic centimetres to 1 decimal place. 2
- (ii) its capacity to the nearest millilitre. 3

24

(12 MARKS)

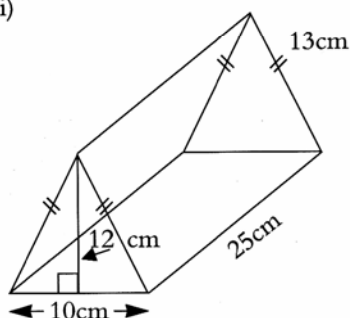
- A** Find the surface area of the following solids.

(i)



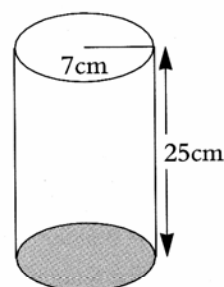
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(ii)



2

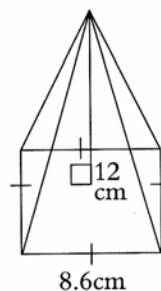
(iii)



2

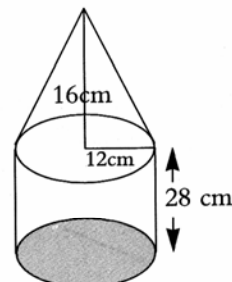
- B** Calculate the volume of the following solids.

(i)



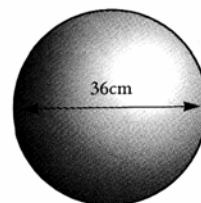
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(ii)



2

(iii)



2

25

(12 MARKS)

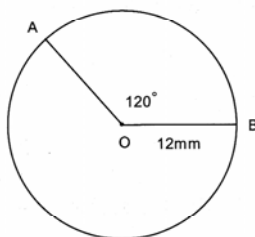
- A** Use your calculator to find the following correct to 2 decimal places.

(i) $\sin 40^\circ - \tan 30^\circ + \cos 65^\circ$ 1

(ii) $\frac{\sin 23^\circ + \cos 23^\circ}{\tan 23^\circ}$ 1

M7 – SPHERICAL GEOMETRY – QUESTION SET A

- 1 A and B are two points on the circumference of a circle, centred at O with a radius of 12mm.



Find the length of the arc AB, correct to two decimal places.

1

- 2 The approximate coordinates of Tokyo are $36^{\circ}N$ $131^{\circ}E$ and of Sydney are $34^{\circ}S$ $151^{\circ}E$.

i) What is the difference in longitude between Tokyo and Sydney?

1

ii) What is the local time difference between these two cities?

1

- 3 The location of Perth, Australia is $32^{\circ}S$ $115^{\circ}E$ and the location of Denpasar, Bali is $8^{\circ}S$ $115^{\circ}E$.

i) What is the difference in latitude between these two places?

1

ii) How many nautical miles are there between Perth and Denpasar?

1

iii) A group of sailors need to deliver a cargo within 36 hours. If their boat travels at an average speed of 22 knots, will they be able to deliver on time. Justify your answer with appropriate calculations.

3

4 Salvador, Brazil is located at $13^{\circ}S$ $38^{\circ}W$ and Darwin, Australia is located at $13^{\circ}S$ $130^{\circ}E$.

i) What is the difference in longitude between Salvador and Darwin?

1

ii) Calculate the distance between Salvador and Darwin in kilometres. Assume the radius of the Earth is 6400km.

1

iii) What is the time difference between the two locations?

1

5 The location of New York is $40^{\circ}S$ $74^{\circ}W$ and the location of Rome is $42^{\circ}S$ $12^{\circ}E$.

i) Find the longitudinal distance between the two locations.

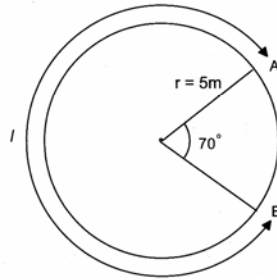
1

ii) Calculate the local time difference between New York and Rome.

1

M7 – SPHERICAL GEOMETRY – QUESTION SET B

- 1 A and B are two points on the circumference of a circle radius 5 metres.



Calculate the length l correct to three significant figures.

2

- 2 New Delhi is located at $29^{\circ}N\ 77^{\circ}E$ and Osaka is located at $35^{\circ}N\ 135^{\circ}E$.

i) What is the local time difference between New Delhi and Osaka?

1

ii) Is the time in Osaka earlier or later than the time in New Delhi?

1

iii) When it is noon in Osaka, what time is it in New Delhi?

1

- 3 A plane is flying from Moscow $56^{\circ}N\ 37^{\circ}E$ to Nairobi $1^{\circ}S\ 37^{\circ}E$.

i) What is the distance between these two locations in nautical miles?

2

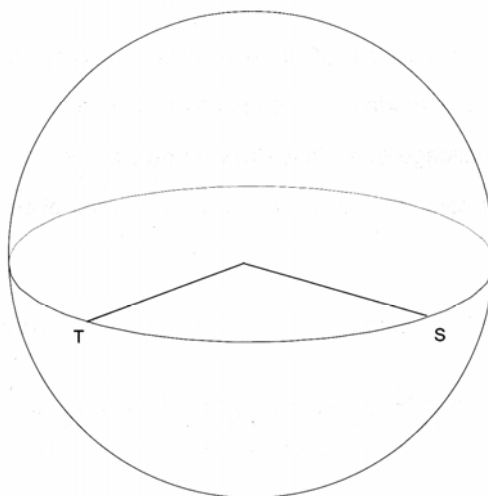
ii) Assuming the plane flies at a speed of 425 knots, how long will it take to travel between these two locations. Give your answer to the nearest hour.

1

iii) If the plane leaves Moscow at 5pm Monday, what time does the plane land in Nairobi?

1

- 4 The diagram below represents the surface of the Earth, where S and T represent coordinates. The coordinates of S are $0^{\circ} 55^{\circ}E$ and the coordinates of T are $0^{\circ} 42^{\circ}W$.



Calculate the distance between the two points, giving your answer to the nearest kilometre, where the radius of the earth is 6400km.

2

- 5 The local time difference between Town A and Town B is 3 hours and 44 minutes. If the coordinates of Town A are $10^{\circ}S 98^{\circ}W$ and Town B is East of Town A, find the coordinates of Town B. Assume that they are at the same latitude.

2
